VALUE OF INTERNATIONAL EMISSIONS TRADING PARTNERSHIPS

Bottom-up linking is now seen as a necessary stepping stone to more global emissions trading markets. But how might the early movers fare? In this article, Richard Richels and Steven Rose explore the possible value of a partnership between the US, the EU and China

Achieving stringent long-run climate objectives may be expensive, with rapidly rising marginal costs.[1] Policy design will thus be important, and measures that will reduce mitigation costs require serious consideration. The goal of international emissions permit trade in today's bottom-up policy environment is to reduce the costs for trading partners of meeting their national commitments. We recognise, however, that cost-effectiveness is but one of many considerations when designing climate policy.

This paper discusses the potential of one such possible partnership that engages three major emitters: China, the EU and the US. We use the MERGE Model (a **m**odel for **e**valuating **r**egional and **g**lobal **e**ffects of GHG reduction policies)[2] to examine the benefits from such a partnership. MERGE is an intertemporal computable general equilibrium model that optimises the discounted utility of regional consumption. Thus, both present and expected future net returns are considered in investment decisions.

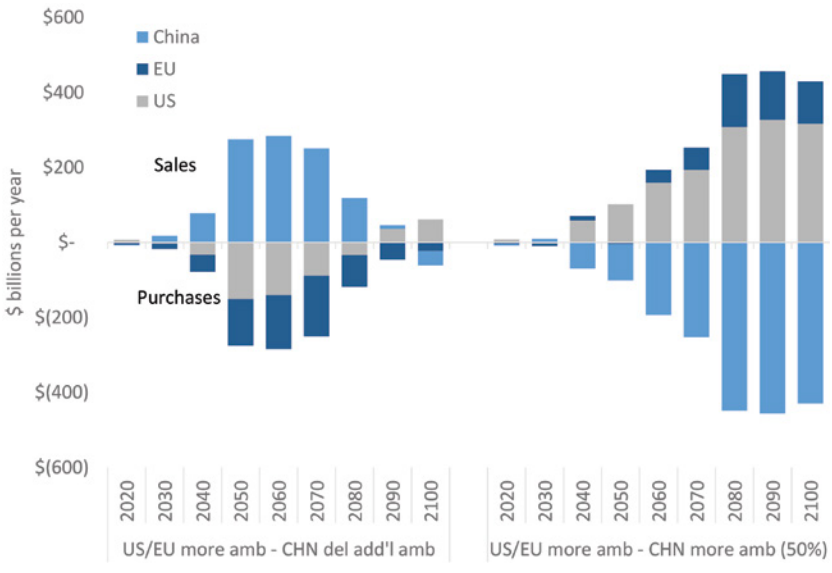
Given the long-lived nature of energy producing and energy using capital stock (eg, power plants, transportation, buildings), analysing near-term decisions requires a long-term perspective. In general, near-term investment decisions are best analysed in the context of potential long-term policy and markets. The model can also be easily configured with regard to the number of regions to be examined. Hence, it lends itself to the evaluation of a broad range of potential partnerships and how they might be melded into a more comprehensive system.

For the present analysis, we consider the period 2020 to 2100. We assume that each region pursues its respective near-term Intended Nationally Determined Contribution (INDC) pledge through 2025/2030, and ambition to 2050 if expressed. For the EU, we assume that its economy-wide GHGs are reduced 40% below its 1990 levels by 2030. Subsequently, it reduces emissions by 80% below 1990 levels by 2050. For the US, we assume its economy-wide GHGs are reduced by 28% below their 2005 levels by 2025. Subsequently, the US reduces emissions by 80% below 2005 levels by 2050.

However, whereas China has pledged to peak its emissions by 2030, its post-2030 ambition remains uncertain, and is explored through sensitivity analysis (Table 1). Specifically, we examine each of the following two post-2030 pathways: 1) delayed additional ambition with emissions flat at 2030 levels until 2050, and 2) more ambitious mitigation immediately after the 2030 peak with the ambition of emissions reductions of 50% below 2030 levels in 2050. For the remainder of our policy horizon (post-2050 through 2100), we assume that each region continues to reduce emissions by 1.5% per year.

Figure 1 shows the estimated aggregate value of permit flows between the three regions. This represents the product of the permit volume and the permit price at each point in time. China's long-run ambition has

FIGURE 1: ANNUAL EMISSIONS PERMIT MARKET FINANCIAL FLOWS



important implications for permit volume, price, financial flows, and direction of trade. In Scenario I, China makes no additional commitments beyond their initial peaking pledge until 2050, while the EU and US pursue their respective 2050 objectives. In this scenario, China is selling permits into the emissions market and the other regions are buying, which allows the EU and US to follow more gradual domestic emissions reduction paths. Specifically, the EU and US cumulative reductions through 2050 are reduced by 25% and 15%, respectively, and through 2100 by 15% and 10%, respectively. In this scenario, annual trade volume reaches as high as 3.6 billion tCO_2 equivalent (CO_2e) per year with permit prices rising from roughly $40 to $190/$tCO_2e$.

If China adopts a tighter constraint on post-2030 emissions, the volume, prices and financial flows change, as do trading positions. Indeed, in Scenario II, China is buying emissions permits during most of the century, after modest sales early on. The increased ambition on the part of China produces higher permit prices (starting at about $40 and rising to $255/$tCO_2e$) with annual permit trade volume peaking at 1.9 billion tCO_2e during the period. Thus, the EU and US are accelerating domestic emissions reductions and receiving permit revenues, while China reduces its domestic rate of cumulative emissions reductions through 2050 and 2100 by 5%. The total discounted present value of the financial flows in the respective permit markets are $1.32 and $1.26 trillion.

THE GOAL OF INTERNATIONAL EMISSIONS PERMIT TRADE IN TODAY'S BOTTOM-UP POLICY ENVIRONMENT IS TO REDUCE THE COSTS FOR TRADING PARTNERS OF MEETING THEIR NATIONAL COMMITMENTS

TABLE 1: SCENARIO SPECIFICATION

		Post-INDC Pledge		
		Through 2050		Post-2050
Scenario	Implementation of INDC Pledge	EU and US	China	All regions
I	Pledges to 2025/2030	More ambitious*	Delayed additional ambition#	Reduce 1.5%/year from 2050
II	Pledges to 2025/2030	More ambitious*	More ambitious (50%)^	Reduce 1.5%/year from 2050

For permit trading, each region is assigned annual emissions caps. For the US and EU, the caps are their emissions targets with linear interpolation in between. For China, a 2030 cap is set equal to the peaking level we estimate when China pursues the more ambitious long-run policy unilaterally.
* EU and US 2050 policies are Kyoto GHGs 80% below 1990 and 2005 levels respectively.
# Kyoto GHGs ≤ 2030 level to 2050.
^ Kyoto GHGs 50% below 2030 cap in 2050.

Figure 2 shows the discounted gains in aggregate consumption associated with trade in emission permits. The gains in consumption represent reduced mitigation investments due to emissions permit purchases and revenues from permit sales. The figure shows a key result from our analysis: emissions trading could be beneficial to each region within the coalition, but that the distribution of benefits will vary from one scenario to another.

In the first scenario, all three regions benefit from trading, but with different permit trade positions and levels of activity due to differences in regional emissions abatement costs. In the second scenario, the partners again all benefit from trading, but regional permit market positions have flipped buyers and sellers due to China's more ambitious policy. Looking across the scenarios, we find more aggregate benefits from trading to the partnership as a whole when all partners have greater long-run reductions ambition, with the benefits of trade to China and the US increasing, and the benefits to the EU declining. China's increased ambition pushes China into higher domestic marginal abatement costs relative to their partners, making permit imports appealing, while lower relative marginal costs at this time in the US result in the US being best suited to increase abatement effort and export permits.

This analysis is useful not so much for the absolute value of the numbers but their relative values. We adhere to the maxim that the purpose of modelling is more insights than numbers. With this in mind, we believe that our ongoing analysis, only a part of which is discussed in this short note, provides useful insights.

First, we make the fundamental observation that there is the potential for mutually beneficial emissions trading partnerships. Second, the size of the emissions permit market and whether a country is a seller or buyer will depend upon the composition of the partnership, the individual emission reductions goals of the partners, and their relative marginal costs of emission reductions. Third, permit trade can be beneficial for the citizens in each country regardless of whether countries are permit buyers or sellers.

Fourth, permit trade can lead to transfers of wealth between buyers and sellers and have trade balance implications. Fifth, emissions pathways based on a goal of

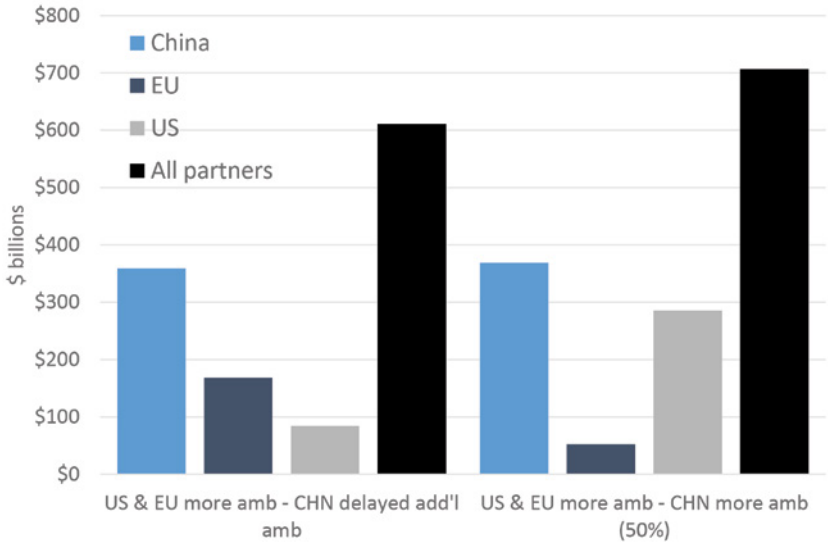
peaking emissions at some date in the future create a challenge for emissions trading. Caps will need to be negotiated and set to participate in trading, but the peaking level will be affected by a variety of factors, many of which are highly uncertain at the present time, such as economic growth, energy efficiency improvements, technology availability and choice, and future ambitions regarding emission reductions. Sixth, expanding the number of members will likely increase the size of benefits for the partnership as a whole, but it may also change the distribution of benefits among members. Hence, there may be a need for side payments, when consideration is given to such expansion.

This short article has only scratched the surface of what may be involved in creating an international market in emissions trading from the bottom-up. It suggests the need for research exploring the following: the potential for additional trading blocs and larger partnerships, the benefits of allowing for the banking of permits, the potential interaction between the availability of low-carbon emitting technologies and emission permit markets, and whether international emissions trading could serve to both increase the scale of the international effort and the receptiveness of countries to pledge verification, since it would likely be a prerequisite to participation in a trading regime.

THE GOALS OF THE PARTNERSHIP MAY NOT ONLY BE TO FOSTER COST-EFFECTIVENESS, BUT ALSO TO ENHANCE ECONOMIC EFFICIENCY

Finally, it is important to keep in mind the environmental objectives of the partnership when considering expansion. The goals of the partnership may not only be to foster cost-effectiveness, but also to enhance economic efficiency. That is, to achieve outcomes which minimise both the economic costs *and* environmental damage.

FIGURE 2: GAINS FROM TRADE IN EMISSIONS RIGHTS
(IN TERMS OF THE INCREASE IN THE VALUE OF AGGREGATE ECONOMIC CONSUMPTION DISCOUNTED TO 2100)



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(1) "Assessing Transformation Pathways" (Leon Clarke, Ke-jun Jiang, and others). In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.G.J. Blanford, R. Mendelsohn, S.K. Rose, 2015. The Price of a Degree: Marginal Mitigation Costs of Limiting Long-Term Temperature Increase, submitted. (2) A. Manne, R. Richels, and R. Mendelsohn. "MERGE: A Model for Evaluating Regional and Global Effects of GHG Reduction Policies," Energy Policy, 23(1), January 1995.

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